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NASA/DoD Aerospace Knowledge Diffusion Research Project

NASA Technical Memorandum 110213

Report Number 37

Factors Motivating and Impeding Information-Seeking By
Early Career-Stage U.S. Aerospace Engineers and Scientists –
Results of an Initial Investigation

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July 1996

National Aeronautics and Space Administration

Department of Defense

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FACTORS MOTIVATING AND IMPEDING INFORMATION-SEEKING BY EARLY CAREER-STAGE U.S. AEROSPACE ENGINEERS AND SCIENTISTS—RESULTS OF AN INITIAL INVESTIGATION

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ABSTRACT

Selected results from an investigation that focused on the factors motivating and impeding information-seeking by early career-stage (i.e., new) U.S. aerospace engineers and scientists are reported. Undertaken as a Phase 1 activity of the *NASA/DoD Aerospace Knowledge Diffusion Research Project*, this initial investigation used mail (self-reported) surveys to collect data from 312 members of the American Institute of Aeronautics and Astronautics (AIAA) who had converted their AIAA memberships from student to professional status and who had an average of 2.7 years of aerospace work experience. We reviewed literature that focused on the socialization of organizational newcomers and the factors that motivate and impede information-seeking by early career-stage professionals. Seven hypotheses, formulated from our review of the literature, were developed and tested. The results of the investigation add to our understanding of information-seeking by organizational newcomers by demonstrating some of the factors that motivate early career-stage U.S. aerospace engineers and scientists to engage in information-seeking.

INTRODUCTION

Engineers in the world of work report that the communication (i.e., production, transfer, and use) of information takes up as much as 80% of their time, that the communication of information is an essential element of successful engineering practice, and that the ability to communicate information effectively is critical to professional success and advancement (Mailloux, 1989). Feedback from professional engineers and from engineers' supervisors concerning engineering competencies ranks communications and information-use skills—the ability to write effectively, to make oral presentations, and to search out and acquire information—*high* in terms of importance to engineering practice. This same feedback, however, ranks the communications and information-seeking skills of entry-level engineers *low* (Bakos, 1986; Chisman, 1987; Katz, 1993; Kimel and Monsees, 1979).

Although communications and information-seeking skills are important to successful technical performance, these same skills are also extremely important to the socialization of "newcomer" engineers (Gundry, 1993). Engineers entering the "world of work" need these skills to obtain information about workplace norms: what they believe they are expected to do to fit into an organization and to work effectively with the people employed by these organizations. Newly hired engineers use communications and information-seeking skills to obtain information about role expectations and organizational values: how other members of the organization think and what they value, how new members are expected to behave, and what is expected of members to fit in and meet organizational expectations, values, and goals.

Whereas communications and information-seeking skills are important for all newly-hired professionals, there is reason to believe that these skills are especially important for entry-level engineers: the job of an engineer requires the continuous production, transfer, and use of information to deal with a constant state of work-related uncertainty. A few studies have focused on engineering manpower and the role of information in career selection (American Association of Engineering Societies, 1986) and the use of and uses for information within the engineering profession (Allen, 1977; Rosenbloom and Wolek, 1970). Our review of the literature produced little information, however, about engineers as organizational newcomers and the role of communications and information-seeking in the socialization process of entry-level engineers.

In this report, we present selected results from an initial investigation that focused on the factors motivating and impeding information-seeking by early career-stage (i.e., new) U.S. aerospace engineers and scientists. Undertaken as a Phase 1 activity of the *NASA/DoD Aerospace Knowledge Diffusion Research Project*, the investigation used mail (self-reported) surveys to collect data from 312 members of the American Institute of Aeronautics and Astronautics (AIAA) who had converted their AIAA memberships from student to professional status and who had an average of 2.7 years of aerospace work experience. We reviewed literature that focused on the socialization of organizational newcomers and the factors that motivate and impede information-seeking by early career-stage professionals. Seven hypotheses, formulated from our review of the literature, were developed and tested.

BACKGROUND

The process of knowledge diffusion (i.e., its production, transfer, and use) is an essential part of aerospace research and development (R&D) and is of paramount importance to innovation within the U.S. aerospace industry. To learn more about this process, researchers at the NASA Langley Research Center, the Indiana University Center for Survey Research, and at various institutions in the U.S. and abroad are participating in the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* Sponsored by NASA and the Department of Defense (DoD), endorsed by several professional societies, and sanctioned by several groups and panels, the *Project* was begin in 1989 as a five-year effort to provide descriptive and analytical data regarding the diffusion of knowledge at the individual, organizational, national, and international levels and to examine both the channels and sources used to diffuse this knowledge and the social system of the aerospace knowledge diffusion process (Pinelli, Kennedy, and Barclay, 1991). The results of this research project could be used to understand the information environment in which U.S. aerospace engineers and scientists work, the information-seeking behaviors of U.S. aerospace engineers and scientists, and the factors that influence their production, transfer, and use of knowledge. Such an understanding could (1) lead to the development of practical theory, (2) contribute to the design and development of systems for diffusing aerospace information, and (3) have practical implications for diffusing the results of federally funded R&D to the U.S. aerospace community. The Project fact sheet is Appendix A.

RELATED LITERATURE AND RESEARCH

We reviewed research and literature that focused on the socialization of organizational newcomers and the factors that motivate and impede information-seeking by early career-stage professionals. We did not review the literature pertaining to the communications practices and information-seeking behaviors of engineering students and professionals in this report. The literature pertaining to the communications practices and information-seeking behaviors of engineering students is reviewed in Pinelli, Hecht, Barclay, and Kennedy (1994). The literature pertaining to the communications practices and information-seeking behaviors of engineers is reviewed in Pinelli, Bishop, Barclay, and Kennedy (1993).

Environment

In recent years, there has been a growing recognition that organizational newcomers actively seek information as a strategy for assimilating into new work environments (Ashford and Black, 1992; Miller and Jablin, 1991; Morrison, 1995; 1993a; 1993b; and Ostroff and Kozlowski, 1992). Within the fields of psychology and communications, information-seeking is seen as a coping strategy essential for dealing with uncertain environments (Berger, 1979; Folkman and Lazarus, 1980; and White, 1974). Because the period of adjustment into a new organization is typically characterized by uncertainty, information-seeking is an activity that newcomers can use to facilitate their own socialization and adaptation (Miller and Jablin, 1991; Morrison, 1993a). Information-seeking has been found to increase newcomers' sense of knowledge and job mastery and their satisfaction, performance, organizational commitment, and intentions to remain in the organization (Morrison, 1993b; Ostroff and Kozlowski, 1992). Unlike cases in which the information is provided to newcomers without their seeking it, active information-seeking gives newcomers control over the type, amount and timing of the information they receive (Morrison, 1993a). It also enables them to compensate in areas where information is not forthcoming. This may be important, as newcomers often feel that they receive less information than they need (Jablin, 1984).

Hanser and Muchinsky (1978) suggested that work situations can be conceptualized as information environments, full of information and cues that individuals can use to improve their work performance and to achieve valued work goals. The information environment contains different types of work-related information, which differ in their availability and usefulness, as well as various information sources, which differ along such attributes as expertise and accessibility. Newcomers' perceptions of these various types and sources of information may well have an important impact on their information-seeking, which in turn has an effect on socialization outcomes as adjustment and commitment. Whereas past research on newcomer information-seeking has investigated different ways in which newcomers seek information and outcomes associated with this activity (Morrison, 1995; 1993a; 1993b; Ostroff and Kozlowski, 1992), scant attention has been devoted to understanding the factors that motivate and impede entry-level engineers as newcomers seeking information.

Information Types

Ostroff and Kozlowski (1992) and Morrison (1993a; 1993b) assessed information-seeking with respect to five types of work-related information: task, role, social, organizational, and feedback information. Task information is defined as information about how to perform specific job tasks and assignments; role information is defined as information about the expectations and responsibilities associated with the job; social information is defined as information about coworkers and about how to behave within the workgroup; organizational information is defined as information about the organization, including policies, procedures, structures, and objectives; and feedback is defined as information about how well one is performing.

Newcomers rely heavily on feedback to obtain in order to successfully assimilate into their organization. Research on feedback-seeking behavior (Ashford, 1986; Morrison and Cummings, 1992; Morrison and Weldon, 1990) has highlighted the importance of this information for enabling employees to assess how well they are performing and to modify their behavior as necessary. Feedback is particularly important for newcomers who are more uncertain about performance-related issues than their more experienced colleagues (Louis, 1980; Miller and Jablin, 1991). The literature on socialization has identified other types of information that newcomers need to obtain as well. Ostroff and Kozlowski (1992) proposed that there are four primary learning domains within socialization related to the newcomer's job, role, workgroup, and organization, respectively. These four domains correspond to the information types that Morrison (1993a; 1993b) assessed in her research on newcomer information-seeking. Morrison proposed that in addition to feedback, newcomers need to obtain information on the following: task duties and procedures; expectations and responsibilities; group norms and interaction patterns; and organizational norms, values, processes, and structures. Her research indicated that newcomers seek each of these information types, with the amount of seeking related to such outcomes as job mastery and role clarity.

Information Sources and Modes

Within a newcomer's information environment are several potential sources of information. Supervisors, coworkers, and mentors have been shown to play important roles in helping newcomers to learn about and adapt to their new environment (Louis, Posner, and Powell, 1983; Morrison, 1993a; Ostroff and Kozlowski, 1992), and newcomers may seek each of the five types of information from these sources through what Ashford and Cummings (1983) referred to as inquiry (Morrison, 1995; Ostroff and Kozlowski, 1992). Inquiry entails directly asking another person for information. A second mode of information-seeking is monitoring or observing which entails observing the environment for informational cues. An advantage of monitoring relative to inquiry is that it is far less obtrusive, and newcomers do not have to worry about others making references about their competency or interpersonal skills, or what Ashford and Cummings (1983) referred to as the "social costs" related to inquiry. A third way in which newcomers can actively obtain information is by consulting written reports, documents, and handbooks (Morrison, 1993b; Ostroff and Kozlowski, 1992). Although certain types of in-

formation do not exist in documented form, this strategy, like monitoring, enables newcomers to avoid the social costs that may be incurred with inquiry.

The decision to seek information is typically depicted as a conscious and rational one. Ashford and Cummings' (1983) model of feedback seeking conceptualizes information as a resource that people use to accomplish various ends. In deciding whether to seek that resource actively, people consider both anticipated costs and anticipated benefits. Vancouver and Morrison's (1995) research on feedback seeking indicates that people also consider costs and benefits when deciding whether to obtain information from a particular source. The next section discusses several factors that affect the perceived costs and benefits of information-seeking and, hence, the degree to which newcomers engage in this behavior.

Costs and Benefits of Information-Seeking

As with any resource, individuals ascribe value or importance to information based on the perceived utility of that information for achieving valued objectives. Although newcomers tend to see some types of information as more valuable than others for adjusting to a new organization (Morrison, 1995), there also will be variance in how valuable newcomers see work-related information in general. Some newcomers will see information as highly critical to their performance and assimilation, whereas others will see it as less so. These perceptions depend on such factors as the nature of the job and work environment, the employee's level of experience and mastery, and his or her tolerance for uncertainty. To the extent that newcomers see work-related information as important or useful, it is predicted that they will be more willing to exert more effort to obtain information, and will thus engage in more information-seeking.

A fundamental motive behind information-seeking is the desire to reduce uncertainty (Berger, 1979; Miller and Jablin, 1991). Uncertainty is described as a state of having insufficient or inconsistent information (Ashford, 1986). For most people, uncertainty is unpleasant and anxiety provoking (Epstein, 1972; Kahn, Quinn, Wolfe, Snoek, and Rosenthal, 1964; McGrath, 1976; Nelson, 1987). Several researchers, therefore, have proposed that one of the most common ways by which individuals try to reduce uncertainty is seeking information (Berger, 1979; White, 1974; Zemore and Shepel, 1987). Further, uncertainty has been found to motivate feedback-seeking behavior (Ashford, 1986). Building on the existing literature, we expect that newcomers will seek information to the extent that they view their work environment as having a high degree of uncertainty.

Although information-seeking is beneficial for reducing newcomers' uncertainty and helping them to achieve valued work goals, it can also be costly (Ashford, 1986). Information-seeking requires time and effort (Ashford and Cummings, 1983). Furthermore, information is difficult to obtain in some cases either because the information is informal and tacit or because the locus of the information is unclear (Morrison, 1995). There is evidence that when trying to obtain technical information, people do so in a way that requires the least amount of effort possible (Gerstberger and Allen, 1968; O'Reilly, 1982). Thus, newcomers predictably will be less willing to seek information that they perceive to be difficult to obtain.

Newcomers have several potential sources of information at their disposal, including supervisors, peers, mentors, and printed documents. Hence, newcomers must determine not only whether it is worthwhile to seek information in general, but also whether it is worthwhile to seek information from a particular source (Morrison and Bies, 1991; Vancouver and Morrison, 1995). Several studies have demonstrated that employees seek different types and amounts of information from supervisors, peers, mentors, and documents. Because these sources differ from one another along several dimensions, however, it is not clear which source attributes actually determine whether a newcomer will select a given source.

Source expertise is defined as the extent to which a given source possesses accurate and useful knowledge about a particular domain. It is predicted that a newcomer's perception of a source's expertise will have a motivating impact on information-seeking. Newcomers seek information in order to obtain knowledge that will be of value to them (Ashford, 1986). Expertise will play an important role in this process because it affects the quality of information that the source is able to provide. It is expected that newcomers will seek more information from a given source to the extent that they see that source as possessing relevant expertise. There is some indirect evidence to support this prediction. Vancouver and Morrison (1995) found that people have a strong preference for sources with high expertise when they are trying to obtain performance feedback, and Pinelli, Bishop, Barclay, and Kennedy (1993) reported that engineers select sources of technical information based, in part, on considerations of quality, relevance, and comprehensiveness.

A second source attribute that will affect information-seeking is perceived accessibility. Accessibility refers to the ease with which one is able to locate and utilize a particular information source. Research on how engineers and scientists obtain scientific and technical information indicates that accessibility is the most important determinant of information use (Allen, 1977; Gerstberger and Allen, 1968; Young and Harriot, 1979). Source accessibility has also been found to have an effect, albeit, a small one, on feedback seeking (Vancouver and Morrison, 1995). It can be expected that accessibility is an important determinant of newcomer information-seeking, and that it plays a role across all of the types of information that newcomers try to obtain. Information-seeking is largely a process of minimizing costs (Pinelli, Bishop, Barclay, and Kennedy, 1993). To the extent that a given source is easily accessible, the costs of the information-seeking are less. Hence, information-seeking should be greater when accessibility is perceived to be high.

It has been hypothesized that newcomers with less tenure (i.e., fewer years of employment) with an organization would engage in more information-seeking than newcomers with longer tenure. There are two primary reasons for this prediction. *First*, the socialization literature suggests that uncertainty is at its highest during the period immediately following entry (Louis, 1980; Miller and Jablin, 1991). As they gain tenure and experience, newcomers acquire increasing amounts of information and uncertainty decreases. The result is that newcomers will come to regard information-seeking as an increasingly less valuable coping strategy. *Second*, as newcomers gain tenure, their colleagues and supervisors may expect them to be knowledgeable and competent, and may thus be increasingly less tolerant of information-seeking. Hence, the

social costs associated with information-seeking may increase with tenure, at least in cases where information must be sought from other persons (Ashford, 1986).

An important assumption underlying research on newcomer information-seeking is that this activity helps newcomers to obtain information that will facilitate their assimilation. If successful, information-seeking should therefore enhance newcomers' knowledge and sense of competence. Ostorff and Kozlowski (1992) did not make a clear distinction between information-seeking and passive modes of information acquisition, yet they found that the more information that newcomers acquired, (whether actively or passively), the greater their knowledge of and sense of adjustment to their work situation. It has been hypothesized that the overall amount of information-seeking in which newcomers engage will increase their level of knowledge in the four socialization domains (task, role, workgroup, and organization), and their sense of adjustment to their job. It has also been hypothesized that by reducing newcomers' uncertainty and facilitating their assimilation, information-seeking will enhance both their job satisfaction and organizational commitment.

Entry and socialization to an organization is a time of learning through confusion and uncertainty and of coming to understand expectations and surviving in an unfamiliar setting (Gundry, 1993). Organizational newcomers are more apt to seek information, and thereby to facilitate their assimilation process, to the extent that they perceive their information environment as uncertain, information as important, and available sources as accessible and knowledgeable. Organizations desiring that newcomers emerge from the socialization process knowledgeable, well assimilated, and committed to their organization may wish to stress the importance of information, encourage information-seeking by newcomers, and ensure that supervisors, colleagues, and other sources of accurate and reliable information are accessible to organizational newcomers.

METHODS

This research was undertaken as a Phase 1 activity of the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* Mail (self-reported) surveys were used to collect data from 312 members of the AIAA who had converted their AIAA memberships from student to professional status in the past five years. The survey was conducted between April and July of 1995.

Sample

The sample consisted of 700 AIAA members. Each member of the sample received an envelope containing a letter, which explained the purpose of the research, a copy of the survey, and a postage-paid return envelope. The letter stated that if the recipient was not employed in aerospace, was unemployed, or if the survey was not applicable, they should write "N/A" on the survey and return it using the postage-paid return envelope. We received 319 completed surveys. Of these, seven surveys were eliminated because the respondents had been employed in aerospace

more than five years. Additionally, 68 members of the sample indicated by either email, telephone, or returned survey, that the survey was not applicable (i.e., N/A). These individuals were eliminated from the sample. By July 19, 1995, 312 usable questionnaires were received; the adjusted response rate for the survey was 51.3%.

The participants in this study had been employed as engineers for three years or less. Hence, this study adopted a broad definition of "newcomer." There is little consensus in the literature about how long employees should be considered to be newcomers, and it is likely that the length of the newcomer period varies across industries and jobs. Most empirical studies of newcomers have restricted their focus to the first year of employment. For the sample used in this study, it seemed appropriate to view the newcomer period as lasting much longer than one year. Lee (1992) and Lee and Allen (1982) noted that it takes at least two years for professional engineers to develop fully in a new work environment, and in one of the few empirical studies of engineering newcomers, Gundry (1993) defined the newcomer period as the first three years in an organization. This longer newcomer period is most likely due to the complex nature of engineering, where an individual is viewed as an apprentice for the first three to five years of employment. It may also stem from the requirements for certification as a professional engineer, which is generally four years of work experience.

Questionnaire

The questionnaire assessed the perceptions of early career-stage U.S. aerospace engineers and scientists concerning their information environment and their information-seeking behavior with respect to five types of information (i.e., task, role, social, organizational, and feedback) as identified by Ostroff and Kozlowski (1992) and Morrison 1993a, 1993b). The survey was also used to collect certain background and demographic information (i.e., gender, age, education, primary duties, years of aerospace work experience, and type of organization where employed). These factors were included for use as control variables. The survey instrument appears as Appendix B.

Measurement

The questionnaire also included three questions about the importance of information. Respondents were asked these questions for each of the five types of information. Importance was measured using a 5-point agree/disagree scale. An overall measure of information importance was computed by creating five subscales and then averaging them together. (The coefficient alpha for the resulting scale was .77.) Uncertainty was assessed with five questions, each of which refers to one of the five types of information mentioned previously. Uncertainty was measured using a 5-point agree/disagree scale. When factor analyzed (principle components with varimax rotation), the items formed a single factor. They were averaged to form a scale which had a coefficient of .78. Difficulty in obtaining information was also measured on a 5-point agree/disagree scale. Two questions were used to measure the difficulty in obtaining information for each of the five types of information. The coefficient alpha for the ten items was .88. Six questions were used to assess source expertise. These questions applied to each of the

following information sources: supervisor, colleague, mentor, and documents. Information-seeking was assessed by asking respondents how much information they obtained through each of the following sources: supervisor, colleague, mentor, through observation, and documents. Knowledge was assessed using a modified version of the knowledge scale designed by Ostroff and Kozlowski (1992), a summary score for each domain was computed by averaging the items representing the particular domain. Although the five scales were reliable, they were highly intercorrelated (bivariate correlations ranged from .44 to .70). It was therefore decided to average the five subscales to form an overall knowledge scale (α = .85).

Adjustment was assessed with five items from Ostroff and Koziowski (1992) and three items from Jones (1986), which all pertained to feelings of job mastery and competence. Sample items are "I feel confident about my ability to perform my job," and "I feel sure of myself in my job position." Job satisfaction was assessed with a three-item scale from Quinn and Staines (1977) and organizational commitment was assessed with the 9-item version of the Organizational Commitment Questionnaire (Mowday, Steers, and Porter, 1979). These three scales appeared on the same section of the questionnaire, with a five-point agree/disagree response option. A principal components analysis indicated that there were three distinct factors, reflecting adjustment, satisfaction, and commitment respectively. Scales were formed by averaging the appropriate items. The reliability coefficients were .86 for adjustment, .85 for satisfaction, and .91 for commitment.

HYPOTHESES

The decision to seek information is typically depicted as a conscious and rational one. Ashford and Cummings' (1983) model of feedback seeking conceptualizes information as a resource that people use to accomplish various ends. In deciding whether to actively seek that resource, people consider both anticipated costs and anticipated benefits. Vancouver and Morrison's (1995) research on feedback seeking builds on this idea, and indicates that people also consider costs and benefits when deciding whether to obtain information from a particular source. This section contains the study's hypotheses and includes a discussion of several factors that affect the perceived costs and benefits of information-seeking, and hence, the degree to which newcomers engage in this behavior and contains the seven hypotheses formulated for the study.

As with any resource, individuals ascribe value or importance to information based on the perceived utility of that information for achieving valued objectives. Although newcomers tend to see some types of information as more valuable than others for adjusting to a new organization (Morrison, 1995), there also will be variance in how valuable newcomers see work-related information in general. Some newcomers will see information as highly critical to their performance and assimilation, whereas others will see it as less so. These perceptions depend on such factors as the nature of the job and work environment, the employee's level of experience and mastery, and his or her tolerance for uncertainty. To the extent that newcomers see work-related information as important or useful, it is predicted that they will be more willing to exert effort to obtain information, and will thus engage in more information-seeking.

H1: Newcomer information-seeking will be positively related to newcomers' perception of the overall importance of information.

A primary motive behind information-seeking is the desire to reduce uncertainty (Berger, 1979; Miller and Jablin, 1991). Uncertainty is defined as a state of having insufficient or inconsistent information (Ashford, 1986). For most people, uncertainty is unpleasant and anxiety-provoking (Epstein, 1972; Kahn, Quinn, Wolfe, Snoek, and Rosenthal, 1964; McGrath, 1976; Nelson, 1987). Several researchers, therefore, have proposed that one of the most common ways in which individuals try to reduce uncertainty is by seeking information (Berger, 1979; White, 1974; Zemore and Shepel, 1987). Further, uncertainty has been found to motivate feedback seeking behavior (Ashford, 1986). Building on the existing literature, it can be expected that newcomers will seek more information to the extent that they view their work environment s having a high degree of uncertainty.

H2: Amount of newcomer information-seeking will be positively related to newcomers' perceptions of uncertainty.

Although information-seeking is beneficial for reducing newcomers' uncertainty and helping them to achieve valued work goals, it can also be costly (Ashford, 1986). Information-seeking requires time and effort (Ashford and Cummings, 1983). Furthermore, information is difficult to obtain in some cases either because the information is informal and tacit or because it is unclear where the information resides (Morrison, 1995). There is evidence that when trying to obtain technical information, people do so in a way that requires the least amount of effort possible (Gerstberger and Allen, 1968; O'Reilly, 1982). It can thus be predicted that newcomer information-seeking will be affected by effort costs, such that newcomers will be less willing to seek information to the extent that they perceive it to be difficult to obtain.

H3: Newcomer information-seeking will be negatively related to perceptions that information is difficult to obtain.

Newcomers have several potential sources of information at their disposal, including supervisors, peers, mentors, and printed documents. Hence, newcomers must determine not only whether it is worthwhile to seek information in general, but also whether it is worthwhile to seek from a particular source (Morrison and Bies, 1991; Vancouver and Morrison, 1995). Several studies have demonstrated that employees seek different amounts and types of information from supervisors, peers, mentors, and documents. Because these sources differ from one another along several dimensions, however, it is not clear which source attributes actually determine whether a newcomer will select a given source. This study assesses two specific source attributes: expertise and accessibility.

Source expertise is defined as the extent to which a given source possesses accurate and useful knowledge about a particular domain. It is predicted that a newcomer's perception of a source's expertise will have a motivating impact on information-seeking. Newcomers seek information in order to obtain knowledge that will be of value to them (Ashford, 1986). Expertise will play an important role in this process because it affects the quality of the information that

a source is able to provide. It is expected that newcomers will seek more information from a given source to the extent that they see that source as possessing relevant expertise. There is some indirect evidence to support this prediction. Vancouver and Morrison (1995) found that people have a strong preference for sources with high expertise when they are trying to obtain performance feedback, and Pinelli, Bishop, Barclay, and Kennedy (1993) reported that engineers select sources of technical information based, in part, on considerations of quality, relevance and comprehensiveness.

H4: Newcomers will seek more information from a given source (e.g. supervisor, peer, mentor, written documents) to the extent that they perceive that source to possess relevant knowledge or expertise.

A second source attribute that will affect information-seeking is perceived accessibility. Accessibility refers to the ease with which one is able to locate and utilize a particular information source. Research on how engineers and scientists obtain scientific and technical information indicates that accessibility is the most important determinant of information use (Allen, 1977; Gerstberger and Allen, 1968; Young and Harriot, 1979). Source accessibility has also been found to have an effect, albeit a small one, on feedback seeking (Vancouver and Morrison, 1995). It can be expected that accessibility is also an important determinant of newcomer information-seeking, and that it plays a role across all of the types of information that newcomers try to obtain. Information-seeking is largely a process of minimizing costs (Pinelli, Bishop, Barclay, and Kennedy, 1993). To the extent that a given source is easily accessible, the costs of information-seeking are less. Hence, information-seeking should be greater when accessibility is perceived to be high.

H5: Newcomers will seek more information from a given source (e.g. supervisor, peer, mentor, written documents) to the extent that they perceive that source to be easily accessible.

This study also assessed the effects of tenure. It was predicted that newcomers with less tenure would engage in more information-seeking than newcomers with longer tenure. There are two primary reasons for this prediction. First, the socialization literature suggests that uncertainty is at its highest during the period immediately following entry (Louis, 1980; Miller and Jablin, 1991). As they gain tenure and experience, newcomers acquire increasing amounts of information, such that uncertainty decreases. The result is that newcomers will tend to see information-seeking as increasingly less valuable as a coping strategy. Second, as newcomers gain in tenure, their colleagues and supervisors may expect them to be knowledgeable and competent, and thus be increasingly less tolerant of information-seeking. Hence, the social costs associated with information-seeking may increase with tenure, at least in cases where information must be sought from other persons (Ashford, 1986).

H6: Amount of newcomer information-seeking will be negatively related to job tenure.

An important assumption underlying research on newcomer information-seeking is that this activity helps newcomers to obtain information that will facilitate their assimilation. If successful, therefore, information-seeking should enhance newcomers' knowledge and sense of competence. Ostroff and Koziowski (1992) did not make a clear distinction between information-seeking and passive modes of information acquisition, yet they found that the more information that newcomers acquired (whether actively or passively), the greater their knowledge and sense of adjustment to their work situation. The present study assesses whether active information-seeking in particular enhances newcomers' knowledge and adjustment. It is hypothesized that the overall amount of information-seeking in which newcomers engage will increase their level of knowledge in the four socialization domains (task, role, workgroup, and organization), and their sense of adjustment to their job. It is also hypothesized that by reducing newcomers' uncertainty and facilitating their assimilation, information-seeking will enhance both their job satisfaction and organizational commitment.

H7: Information-seeking will have a positive impact on newcomers' knowledge, adjustment, job satisfaction, and organizational commitment.

TEST OF THE HYPOTHESES

Scale means and intercorrelations are in Tables 1 and 2. Table 1 contains all of the variables used to test Hypotheses 1-6, whereas Table 2 contains the variables used to test Hypothesis 7. Hypotheses 1 through 6 were tested by regressing each of the five information-seeking scales on the following measures: information importance, uncertainty, difficulty, source expertise, source accessibility, and tenure. Hypothesis 7 was tested by regressing knowledge, adjustment, satisfaction, and commitment on the five information-seeking scales. Preliminary analyses indicated that age and sector (e.g., academia, industry, government) were not significantly related to any of the dependent variables. They were therefore not included as control variables. Gender, education, and primary duties (research and development vs "other") were related to some of the variables under investigation, and thus were included as controls.

The results for the first set of regression analyses are in Table 3. Consistent with Hypothesis 1, information importance was related to asking one's supervisor (β = .12) and observing (β = .15). Consistent with Hypothesis 2, uncertainty was related to asking colleagues (β = .11) and asking mentors (β = .12). Hypothesis 3 predicted that the perceived difficulty of obtaining information would deter information-seeking. This was supported for asking colleagues (β = .12). However, perceived difficulty had a positive effect on seeking through observation (β = .14). The strongest and most consistent factor affecting newcomer information-seeking was source expertise (Hypothesis 4). It was related to asking one's supervisor (β = .47), asking peers (β = .60), asking a mentor (β = .52), and consulting documents (β = .52). In support of Hypothesis 5, perceived source accessibility had an effect on asking supervisors (β = .18) and consulting documents (β = .11). Contrary to what was expected, tenure had a positive effect on asking mentors (β = .52). It did not have an effect on any other of the information-seeking measures.

Table 1: Correlations and Descriptive Statistics.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Uncertainty	.78[a]															
2. Information Value	-.09	.85														
3. Difficulty of Obtaining	.51**	-.11	.88													
4. Supervisor Accessibility	-.29**	.13*	-.31**	.76												
5. Colleague Accessiblity	-.26**	.14*	-.25**	.27**	.83											
6. Mentor Accessibility	-.15*	.11	-.26**	.26**	.41**	.83										
7. Document Accessibility	-.27**	.17**	-.23**	.21**	.18**	.15*	.82									
8. Supervisor Expertise	-.44**	.20**	-.29**	.54**	.18**	.16*	.12*	.86								
9. Colleague Expertise	-.25**	.26**	-.23**	.06	.48**	.20**	.17**	.22**	.82							
10. Mentor Expertise	-.31**	.33**	-.32**	.18**	.36**	.51**	.29**	.36**	.41**	.82						
11. Document Expertise	-.27**	.31**	-.08	.10	.10	.11	.38**	.20**	.28**	.26**	.80					
12. Ask Supervisor	-.32**	.23*	-.18**	.45**	.10	.03	.15**	.62**	.14*	.13	.17**	.76				
13. Ask Colleagues	-.09	.21**	-.09	-.02	.29**	.09	.10	.10	.53**	.21**	.22**	.28**	.80			
14. Ask Mentor	-.03	.19**	-.10	.00	.17*	.37**	.12	.09	.17*	.57**	.10	.24**	.38**	.85		
15. Consult Documents	-.11*	.19**	-.01	.06	-.03	-.02	.28**	.07	.15**	.04	.55**	.19**	.26**	.03	.71	
16. Observe	-.02	.18**	-.13*	.06	.14*	.23**	.10	.07	.23**	.33**	.10	.10	.32**	.31**	.13*	.81
Scale Mean	2.51	3.84	2.32	4.09	4.35	4.21	4.09	4.02	3.74	4.17	2.75	3.29	2.96	3.45	2.33	3.77
Standard Deviation	.82	.56	.79	.87	.71	.93	.94	.82	.69	.67	.93	.80	.80	.94	.76	.81

[a]Entries on diagonal are Cronbach's alpha.

*p < .05; **p < .01.

Table 2: Correlations and Descriptive Statistics.[a]

	1	2	3	4	5	6	7	8	9
1. Ask Supervisor	.76								
2. Ask Colleagues	.28**	.80							
3. Ask Mentor	.24**	.38**	.85						
4. Consult Documents	.19**	.26**	.03	.71					
5. Observe	.10	.32**	.31**	.13*	.81				
6. Adjustment	.16**	-.02	-.01	.13*	.07	.86			
7. Knowledge	.34**	.17**	.17*	.22**	.14*	.46**	.86		
8. Satisfaction	.28**	.05	.06	.11*	.07	.10	.26**	.85	
9. Commitment	.26**	.15**	.13	.21*	.12*	.13*	.31**	.69**	.91
Scale Mean	3.29	2.96	3.45	2.33	3.77	4.15	3.73	3.66	3.40
Standard Deviation	.80	.80	.94	.76	.81	.62	.52	.94	.85

[a]Entries on diagonal are Cronbach's alpha.

*p < .05; **p < .01.

Table 3: Perceptions of Environmental Effects on Information Seeking—Regression Results.

Variables	Ask Supervisor	Ask Colleague	Ask Mentor	Consult Documents	Observe
Gender	.00	.06	-.07	.02	-.03
Education	.02	.06	-.02	.04	-.17*
R&D	-.03	-.07	-.17**	-.11	-.08
Tenure	.04	.05	.15**	-.06	.01
Uncertainty	-.09	.11*	.12*	.06	.09
Value	.12**	.03	.02	.02	.15**
Difficulty	-.06	-.12*	.07	.04	.14*
Accessibility	.18***	-.02	.10	.11*	
Expertise	.47***	.60***	.52***	.52***	
R^2	.42***	.38***	.39***	.33***	.08**
N	309	309	206	309	309

Notes: Entries are standardized regression coefficients.

*p < .05; **p < .01; ***p < .001.

Hypothesis 7 predicted that information-seeking would have a positive effect on newcomers' knowledge, adjustment, satisfaction and commitment. As shown in Table 4, this hypothesis was supported. The strongest effect was for asking supervisor. This had a significant effect on all four socialization outcomes: adjustment (β = .15), knowledge (β = .29), satisfaction (β = .28), and commitment consulting documents had an effect on adjustment (β = .12), knowledge (β = .14), and commitment (β = .13), and asking a mentor had an effect on commitment as well (β = .11). Asking colleagues and observing had no effect on the outcome variables.

Table 4: Effects of Information-seeking on Socialization Outcomes—Regression Results.

Variables	Adjustment	Knowledge	Satisfaction	Commitment
Gender (Female)	.17**	.01	-.11	-.06
Education	.17**	.05	.02	-.07
R&D	-.10	-.19***	-.06	-.04
Job Tenure	-.08	-.05	-.05	.05
Ask Supervisor	.15**	.29***	.28***	.21***
Ask Colleague	-.09	.00	-.08	.03
Ask Mentor	.04	.09	.05	.11*
Consult Documents	.12*	.14*	.07	.13*
Observe	.07	.05	.05	.05
R^2	.11***	.19***	.11***	.12***

Note: Entries are standardized regression coefficients. N = 309.

*p < .05; **p < .01; ***p < .001.

ANALYSES OF THE DATA

Exploratory analyses were conducted to better understand how newcomers' perceived their information environment and the extent to which they utilized the different sources and modes

of information-seeking. A within-subject analysis of variance (ANOVA) was first used to compare newcomers' perceptions regarding the importance of the various types of information. The five importance subscales were used. The ANOVA demonstrated a strong overall effect [$F(3,954) = 364.99$; $p < .0001$]. Paired contrasts indicated that task ($M = 4.37$; $SD = .81$), role ($M = 4.26$; $SD = .68$), and feedback ($M = 3.97$; $SD = .72$) information were each rated as significantly more important ($p < .05$) than organizational ($M = 3.49$; $SD = .85$) or social ($M = 3.05$; $SD = .86$) information. A second within-subject ANOVA was then conducted to assess newcomers' perceptions of the difficulty of obtaining each of the types of information. There was an overall effect for information type [$F(4, 1272) = 24.54$; $p < .0001$]. Feedback ($M = 2.55$; $SD = 1.14$) and social information ($M = 2.52$; $SD = 1.03$) were seen as more difficult to obtain than organizational ($M = 2.20$; $SD = .99$) or role information ($M = 2.28$; $SD = 1.08$), and all four were seen as more difficult to obtain than task information ($M = 2.05$; $SD = 1.00$). Newcomers' perceptions of the various sources of information were also compared. A within-subject ANOVA demonstrated an overall effect for accessibility [$F(4,860) = 19.22$; $p < .0001$]. Colleagues ($M = 4.35$; $SD = .71$) were seen as significantly more accessible than mentors ($M = 4.21$; $SD = .93$), supervisors ($M = 4.09$; $SD = .87$) and documents ($M = 4.09$; $SD = .94$). The latter three sources did not significantly differ from one another in perceived accessibility. A second ANOVA demonstrated a significant effect for source expertise [$F(4,832) = 135.70$; $p < .0001$]. Mentors ($M = 4.17$; $SD = .67$) were seen as possessing the highest expertise, followed by supervisors ($M = 4.02$; $SD = .82$), colleagues ($M = 3.74$; $SD = .69$), and then documents ($M = 2.75$; $SD = .93$). Paired contrasts confirmed that all differences were statistically significant.

Finally, patterns of information-seeking were assessed. A within-subject ANOVA showed a significant effect related to mode of seeking [$F(5,1005) = 85.18$; $p < .0001$]. The means, in decreasing order were 3.77 ($SD = .81$) for observation, 3.45 ($SD = .94$) for asking mentors, 3.29 ($SD = .79$) for asking supervisors, 2.96 ($SD = .80$) for asking colleagues and 2.33 ($SD = .76$) for consulting documents. Paired contrasts demonstrated that each mean was significantly different from each of the other means.

DISCUSSION

Newcomer information-seeking has been receiving a growing amount of research attention. This activity has been found to facilitate newcomer assimilation and to lead to work outcomes that are valued by both newcomers and organizations (Morrison, 1993a; 1993b; and Ostroff and Koziowski, 1992). The results of this study add to our understanding of newcomer information-seeking by demonstrating some of the factors that motivate newcomers to engage in information-seeking. The results indicate that different factors predict different forms of seeking. To the extent that newcomers experienced a high degree of work-related uncertainty, they were more likely to ask colleagues or mentors for information. Perceptions of information importance, on the other hand, predicted entirely different forms of information-seeking. Newcomers who considered information to be of high importance were more likely to ask their supervisors and to engage in observation. If newcomers perceived that information was difficult to obtain in their

work environment, they were less likely to ask colleagues, but more likely to engage in observation as a mode of information-seeking.

Source-related factors were also highly important in driving newcomer information-seeking. The perception that a particular source was a useful repository of knowledge was the strongest predictor of seeking from that source. This is highly consistent with a resource model of information-seeking (Ashford and Cummings, 1983) which says that people decide whether to expend effort to obtain information based on the ends that the information will help them to achieve. To the extent that a source is high on expertise, seeking information from that source will help a newcomer to reduce uncertainty and learn about his or her job requirements and work environment. Yet there was also evidence that newcomers consider the costs involved in obtaining information from a particular source. Perceptions of source accessibility had a positive effect on asking supervisors and consulting documents. Despite the potential usefulness of these sources, newcomers were less likely to use them if they believed that doing so would require a high degree of effort.

The findings with respect to tenure were different from what was expected. Whereas the socialization literature suggests that information-seeking will be inversely related to experience on the job, tenure had relatively little effect. This is particularly surprising because this study defined the newcomer period so broadly. Whereas one might expect to see little difference in the amount of information-seeking between newcomers with six months of experience and those with nine months (e.g. Morrison, 1993b), it is more surprising that there were no differences between those with one year of experience and those with three years. It appears that the value of information does not decline over this span of time, nor do the social costs of information increase. Alternatively, it is possible that newcomers need different types of information over time, or information of increasing complexity, yet their overall information requirements remain the same. One very interesting finding related to tenure was that as tenure increased, newcomers sought more information from mentors. Since none of the other forms of seeking decreased in frequency, this suggests that mentors may provide types of information that are not important early on, but that are seen as increasingly important over time. It is also likely that the newcomer-mentor relationship takes time to develop, and thus may be relied upon more as newcomers become more comfortable with their mentors.

In sum, whereas each of the predicted factors had an effect on the frequency of newcomer information-seeking, a rather complex picture emerges of the newcomer information-seeking process. The results highlight the importance of considering the particular source and mode of seeking, because in different situations newcomers seek information in different ways. The results also show that newcomers consider the accessibility and expertise of available sources when deciding whether to seek (Vancouver and Morrison, 1995). Hence, newcomers with the same informational needs may engage in different amounts and forms of information-seeking depending on the attributes of available sources.

Consistent with other studies on newcomer information-seeking, information-seeking had an effect on socialization outcomes. The frequency of information-seeking, particularly when it

entailed asking one's supervisor, was positively related to adjustment, knowledge, satisfaction and commitment. These results indicate that information-seeking is effective in helping newcomers to assimilate, and that supervisors in particular are important sources of information that helps newcomers to reduce uncertainty and become comfortable in their new environment.

Finally, the ANOVA results, which were exploratory, provided some interesting insight into newcomer information-seeking and how newcomers perceive their information environment. With respect to information importance, newcomers rated job-related information (e.g., task, role and feedback) as more important than information related to coworkers or the organization. This finding is consistent with the socialization literature, which suggests that newcomers focus most of their attention on job mastery, attaching secondary importance to social and cultural integration (Fisher, 1986).

Task information was seen as the easiest type to obtain, and social and feedback information were seen as the most difficult. The perceived difficulty of obtaining social and feedback information may be rooted in the evaluative nature of these types of information, the necessity of obtaining them from other persons rather than from manuals or other written documents, and the discomfort that newcomers may experience in asking about their own performance or about other persons. Task-related information, on the other hand, is objective and is apt to be readily available in written form. Additionally, we might expect that it is highly acceptable for newcomers to ask for technical or task-related information, which is commonly exchanged in engineering settings (Pinelli, Bishop, Barclay, and Kennedy, 1993).

Newcomers perceived their colleagues to be lower on expertise than mentors or supervisors, yet more accessible than other source. The high accessibility of colleagues, however, seemed to have little impact on newcomers' information-seeking behavior. Instead, newcomers' patterns of information-seeking directly matched their perceptions of expertise. The sources were ranked in the following order with respect to expertise: mentors, supervisors, colleagues, and documents. The same ordering was found for information-seeking, supporting the regression results which demonstrated a strong relationship between seeking and perceived expertise.

CONCLUDING REMARKS

The fact that this study entailed self-reports gathered at a single point in time poses some limitations. Although many studies of newcomers collect both independent and dependent variables from the same source, when these are collected at the same point in time there is a greater risk of common method bias. This bias may have inflated some of the correlations. In addition, cross-sectional data mean that one cannot be entirely certain of causal direction. These limitations must be kept in mind in interpreting the results of this study.

Its limitations notwithstanding, this study provides a clear picture of some of the factors that drive newcomers (i.e., early career-stage U.S. aerospace engineers and scientists) to seek information. Newcomers are more apt to seek information, and thus more apt to facilitate their

assimilation process, to the extent that they perceive their information environment as uncertain, information as important, and available sources as accessible and knowledgeable. These findings are important from a practical point of view in that they suggest ways in which organizations can encourage greater information-seeking from newcomers, they also indicate reasons why some newcomers may not be sufficiently proactive in obtaining the information that they need. Organizations that wish to encourage more information-seeking must convey to newcomers the importance of information and ensure that supervisors, colleagues, and other sources are both accessible and able to provide accurate and useful information. This, in turn, will help to ensure that newcomers emerge from the socialization process knowledgeable, well assimilated, and committed to their organization.

ACKNOWLEDGEMENT

The authors thank the AIAA and the members who participated in this study. Ms. Karen Holloway served as the AIAA point of contact.

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APPENDIX A: PROJECT FACT SHEET

NASA/DoD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT

Fact Sheet

The process of producing, transferring, and using scientific and technical information (STI), which is an essential part of aerospace research and development (R&D), can be defined as *Aerospace Knowledge Diffusion*. Studies tell us that timely access to STI can increase productivity and innovation and help aerospace engineers and scientists maintain and improve their professional skills. These same studies indicate, however, that we know little about aerospace knowledge diffusion or about how aerospace engineers and scientists find and use STI. To learn more about this process, we have organized a research project to study knowledge diffusion. Sponsored by NASA and the Department of Defense (DoD), the *NASA/DoD Aerospace Knowledge Diffusion Research Project* is being conducted by researchers at the NASA Langley Research Center, the Indiana University Center for Survey Research, and Rensselaer Polytechnic Institute. This research is endorsed by several aero- space professional societies including the AIAA, RAeS, and DGLR and has been sanctioned by the AGARD and AIAA Technical Information Panels.

This 4-phase project is providing descriptive and analytical data about the flow of STI at the individual, organizational, national, and international levels. It is examining both the channels used to communicate STI and the social system of the aerospace knowledge diffusion process. Phase 1 investigates the information-seeking habits and practices of U.S. aerospace engineers and scientists, in particular their use of government-funded aerospace STI. Phase 2 examines the industry-government interface and emphasizes the role of the information intermediary in the knowledge diffusion process. Phase 3 concerns the academic-government interface and emphasizes the information intermediary-faculty-student interface. Phase 4 explores the information-seeking behaviors of non-U.S. aerospace engineers and scientists from Western European nations, India, Israel, Japan, and the former Soviet Union.

The results of this research project will help us to understand the flow of STI at the individual, organizational, national, and international levels. The findings can be used to identify and correct deficiencies; to improve access and use; to plan new aerospace STI systems; and should provide useful information to R&D managers, information managers, and others concerned with improving access to and utilization of STI. These results will contribute to increasing productivity and to improving and maintaining the professional competence of aerospace engineers and scientists. The results of our research are being shared freely with those who participate in the study.

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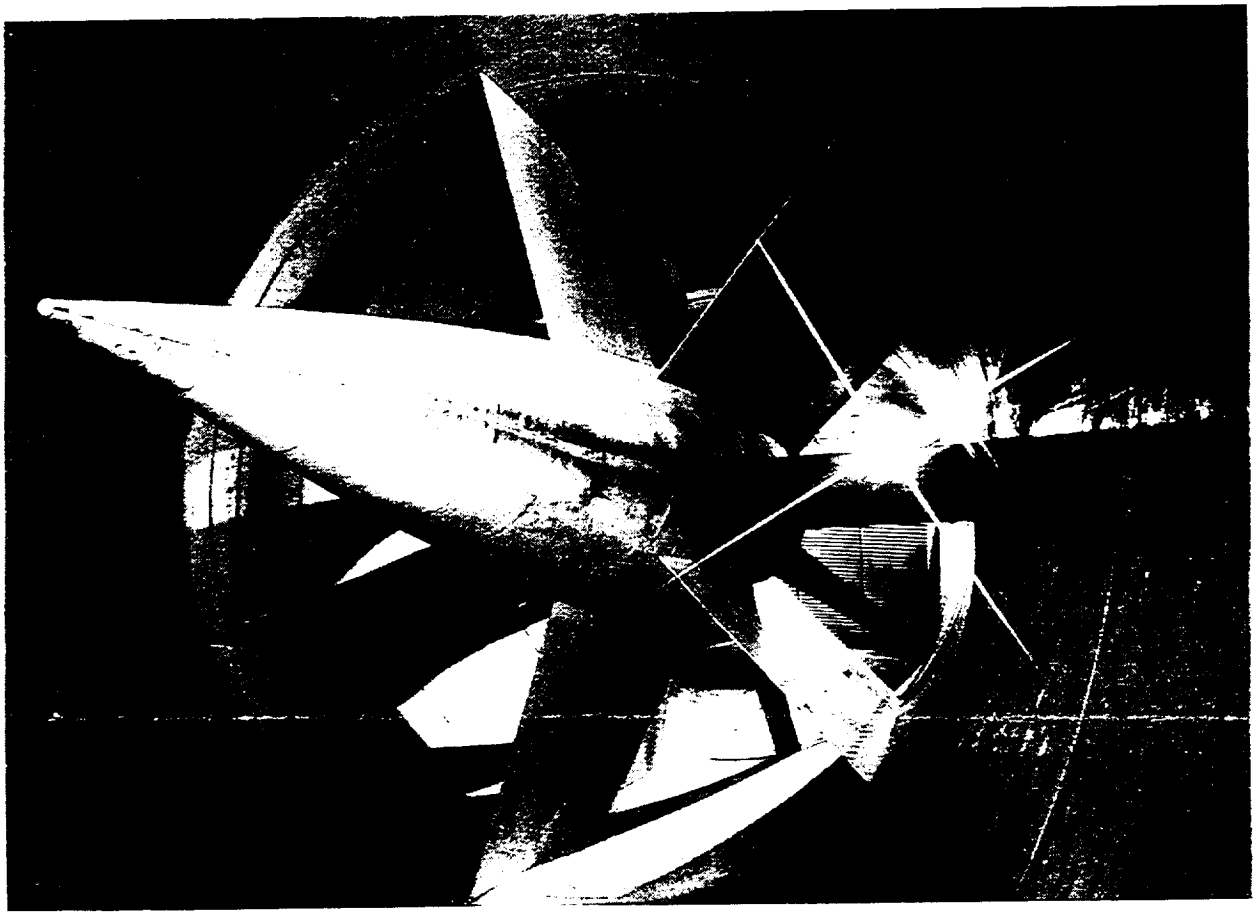
APPENDIX B: INSTRUMENT

PHASE 1 OF THE
NASA/DOD AEROSPACE KNOWLEDGE
DIFFUSION RESEARCH PROJECT

Technical Communications in Aerospace:

How Early Career Stage Aerospace Engineers and Scientists Obtain Information

AIAA Study



SPONSORED BY THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND THE DEPARTMENT OF DEFENSE WITH THE COOPERATION OF NEW YORK UNIVERSITY AND THE AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA)

First, we ask a series of questions about how early career stage aerospace engineers and scientists obtain work-related information.

1. This first section asks your opinions about five types of work-related information:

Task Information:	Information about how to perform specific job tasks and assignments
Role Information:	Information about the expectations and responsibilities associated with your job
Social Information:	Information about your co-workers and about how to behave within your workgroup
Company Information:	Information about the company or organization where you work (policies, procedures, structure, and objectives)
Feedback Information:	Information about how well you are performing your job

There are six statements below. Please indicate the extent to which you disagree or agree with each statement for each of the five types of work-related information identified above. Write your responses on the appropriate lines in each column, using the following scale:

1 = strongly disagree
2 = somewhat disagree
3 = neither disagree or agree
4 = somewhat agree
5 = strongly agree

	Task	Role	Social	Company	Feedback
a. It is extremely important that someone in your position have information of this type	____	____	____	____	____
b. You would be unable to carry out your job without such information	____	____	____	____	____
c. Information of this type is extremely valuable for people in your position	____	____	____	____	____
d. Information of this sort is extremely difficult for people in your position to obtain	____	____	____	____	____
e. Assuming you wished to do so, it would be very difficult for you to obtain such information	____	____	____	____	____
f. You would be uncomfortable asking someone for information of this sort	____	____	____	____	____

2. This section includes nine statements about five potential sources of information:

Supervisor: The person to whom you directly report

Friend: A colleague at work who you view as a personal friend

Colleagues: Co-workers at the same level as yourself who perform duties similar to you (other than those you view as personal friends)

Mentor: A person at a higher level than yourself who is committed to providing you with career guidance and/or support (other than your direct supervisor)

Documents: Manuals, company documents, computerized information services or data bases

Please respond to each statement below for all five sources of information identified above, writing your responses in the appropriate column. If one or more sources are not applicable (for example, if you do not have a mentor), please write 6 for "not applicable." For those sources that are applicable, please use the following scale to respond.

1 = strongly disagree
2 = somewhat disagree
3 = neither disagree or agree
4 = somewhat agree
5 = strongly agree
6 = not applicable

		Supervisor	Friend	Colleagues	Mentor	Documents
a.	This source is a good repository of knowledge about how to perform specific job tasks and assignments	____	____	____	____	____
b.	This source is a good repository of knowledge about the expectations and responsibilities for your job	____	____	____	____	____
c.	This source is a good repository of knowledge about your co-workers and about how to act within your workgroup	____	____	____	____	____
d.	This source is a good repository of knowledge about the organization where you work	____	____	____	____	____
e.	This source is a good repository of knowledge about how well you are performing your job	____	____	____	____	____
f.	Overall, this source is a repository of useful knowledge	____	____	____	____	____
g.	This source is readily accessible to you	____	____	____	____	____
h.	You could contact this source very easily if you needed to obtain information	____	____	____	____	____
i.	You would be very comfortable obtaining information from this source	____	____	____	____	____

3. This section includes a list of eight means of obtaining work-related information. We are interested in how you have obtained task information, role information, social information, company information, and feedback information since you began your job.

Task Information: Information about how to perform specific job tasks and assignments

Role Information: Information about the expectations and responsibilities associated with your job

Social Information: Information about your co-workers and about how to behave within your workgroup

Company Information: Information about the company or organization where you work (policies, procedures, structure, and objectives)

Feedback Information: Information about how well you are performing your job

Separately, for each information type, indicate how much of that information you have obtained through each of the eight means listed below. If one or more sources are not applicable (for example, if you do not have a mentor), please write 6 for "not applicable." For those sources that are applicable, please use the following scale to respond. You should write your responses on the appropriate lines in each column, using the following scale:

1 = none at all
2 = only a little
3 = some
4 = a lot
5 = a great deal
6 = not applicable

	Task	Role	Social	Company	Feedback
a. By asking your supervisor	____	____	____	____	____
b. By asking a friend	____	____	____	____	____
c. By asking a colleague	____	____	____	____	____
d. By asking a mentor	____	____	____	____	____
e. By observing the situation around you	____	____	____	____	____
f. By consulting manuals, company documents, or computerized information services or data bases	____	____	____	____	____
g. By other people giving you this information without your asking for it	____	____	____	____	____
h. By other means (please specify below)	____	____	____	____	____

_____

_____

_____

4. There are 18 statements below. Please indicate the extent to which you disagree or agree with each. (Circle Appropriate Number)

		Strongly Disagree				Strongly Agree
a.	My workplace is characterized by a high level of uncertainty about how to perform various job tasks and assignments	1	2	3	4	5
b.	My workplace is characterized by a high level of uncertainty about the expectations and responsibilities for my job	1	2	3	4	5
c.	My workplace is characterized by a high level of uncertainty about co-workers and about how to behave within my workgroup	1	2	3	4	5
d.	My workplace is characterized by a high level of uncertainty about organizational policies, procedures, structure and objectives	1	2	3	4	5
e.	My workplace is characterized by a high level of uncertainty about how well I am performing my job	1	2	3	4	5
f.	I try very hard to improve on my past performance at work	1	2	3	4	5
g.	I take moderate risks and stick my neck out to get ahead at work	1	2	3	4	5
h.	I try to perform better than my colleagues	1	2	3	4	5
i.	Achievement is extremely important to me	1	2	3	4	5
j.	It is very important to me that I excel at work	1	2	3	4	5
k.	I function very poorly whenever there is a serious lack of communication in a job situation	1	2	3	4	5
l.	In a situation where other people evaluate me, I feel a great need for clear and explicit instructions	1	2	3	4	5
m.	If I am uncertain about the responsibilities of a job, I get very anxious	1	2	3	4	5
n.	I would be very frustrated if I thought my work might never be completed	1	2	3	4	5
o.	I am often uneasy around other people at work	1	2	3	4	5
p.	I often worry about what others think of me at work	1	2	3	4	5
q.	I get very nervous if I have to ask someone a question at work	1	2	3	4	5
r.	I'm afraid of looking stupid to people at work	1	2	3	4	5

5. Listed below are 25 statements concerning your job. Please indicate the extent to which you feel knowledgeable or not so knowledgeable about each. (Circle Appropriate Number)

	Not at all Knowledgeable				Very Knowledgeable
a. What the channels of authority are in your organization	1	2	3	4	5
b. What is expected of you on the job besides performing well	1	2	3	4	5
c. Who does what in your workgroup	1	2	3	4	5
d. How to use equipment or tools needed for your job	1	2	3	4	5
e. The goals and objectives of your organization	1	2	3	4	5
f. How much authority you have to accomplish your job	1	2	3	4	5
g. What some of the weaknesses are in your job performance	1	2	3	4	5
h. How to get along with your colleagues	1	2	3	4	5
i. How to perform basic tasks and duties correctly	1	2	3	4	5
j. When you can act alone and when you need approval	1	2	3	4	5
k. The atmosphere of interpersonal relationships within your workgroup	1	2	3	4	5
l. What your organization's policies, procedures, and rules are	1	2	3	4	5
m. How to handle routine problems or difficulties with your job	1	2	3	4	5
n. How much you can make up your own rules or ways of doing your job	1	2	3	4	5
o. How to act and behave within your workgroup	1	2	3	4	5
p. What the important norms and values are for your organization	1	2	3	4	5
q. The special language or jargon used in your organization	1	2	3	4	5
r. How others are evaluating your job performance	1	2	3	4	5
s. What the important tasks, duties, and assignments for your job are	1	2	3	4	5
t. Which group members have status, are important, or are respected	1	2	3	4	5

		Not at all Knowledgeable				Very Knowledgeable
u.	The ropes for getting ahead in your organization	1	2	3	4	5
v.	What the standard operating procedures for your job are	1	2	3	4	5
w.	How much you can define or modify your tasks and duties	1	2	3	4	5
x.	How well you are performing	1	2	3	4	5
y.	What your responsibilities are	1	2	3	4	5

6. Listed below are 12 statements about the organization where you work. Please indicate the extent to which you disagree or agree with each. (Circle Appropriate Number)

		Strongly Disagree				Strongly Agree
a.	I am willing to put a great deal of effort beyond that normally expected in order to help my organization be successful	1	2	3	4	5
b.	I talk up this organization to my friends as a great organization to work for	1	2	3	4	5
c.	I would accept almost any type of job assignment in order to keep working for this organization	1	2	3	4	5
d.	I find that my values and the organization's values are very similar	1	2	3	4	5
e.	I am proud to tell others that I am part of this organization	1	2	3	4	5
f.	This organization really inspires my best on-the-job performance	1	2	3	4	5
g.	I am extremely glad I chose this organization to work for over others I was considering	1	2	3	4	5
h.	I really care about the fate of this organization	1	2	3	4	5
i.	For me this is the best of all possible organizations to work for	1	2	3	4	5
j.	I see my employment with this organization as temporary, before I move on to something else	1	2	3	4	5
k.	I will probably look for a new job in a different organization in the next year or so	1	2	3	4	5
l.	I do not intend to remain with this organization for a long time	1	2	3	4	5

7. Listed below are 12 statements about your job. Please indicate the extent to which you disagree or agree with each. (Circle Appropriate Number)

	Strongly Disagree				Strongly Agree
a. My job is well within the scope of my abilities	1	2	3	4	5
b. I have all the technical knowledge I need to do this job	1	2	3	4	5
c. I feel confident that my skills and abilities equal or exceed those of my colleagues	1	2	3	4	5
d. I feel confident about my ability to perform my job	1	2	3	4	5
e. I am able to act independently and without assistance	1	2	3	4	5
f. I feel sure of myself in my job position	1	2	3	4	5
g. I have pretty much adjusted to my job	1	2	3	4	5
h. I have a good system for doing my job	1	2	3	4	5
i. If a good friend expressed interest in a job like mine, I would advise him or her against it	1	2	3	4	5
j. If I had to decide again about taking the job I now hold, I would take it without hesitation	1	2	3	4	5
k. In general, my job is very much what I hoped for when I took it	1	2	3	4	5
l. All in all, I am very satisfied with my job	1	2	3	4	5

Next we ask some questions regarding job performance evaluation.

8. Have you received a performance evaluation since beginning your job? (Circle Number)

   1. Yes
   2. No ⟶ Go to Q. 11

9. If yes, how many months ago was your last performance evaluation?

   _____ months

10. Which of the following most closely reflects how you were rated on that evaluation? (Circle Number)

1. Very much above average
2. Above average
3. About average
4. Below average
5. Very much below average
6. I do not remember my last performance evaluation

We're asking a few questions for AIAA.

11. How important were the following in making your decision to join AIAA? (Circle Number)

	Least Important				Most Important
a. Professional development	1	2	3	4	5
b. Technical information	1	2	3	4	5
c. Networking	1	2	3	4	5
d. Conferences	1	2	3	4	5
e. Publications	1	2	3	4	5
f. Corporate membership	1	2	3	4	5
g. Membership benefits	1	2	3	4	5
h. Other (please specify) _____	1	2	3	4	5

12. In terms of your professional development, how important are the following AIAA products and services? (Circle Number)

	Least Important				Most Important
a. Conferences	1	2	3	4	5
b. Journals	1	2	3	4	5
c. *Aerospace America*	1	2	3	4	5
d. Committees	1	2	3	4	5
e. Local sections	1	2	3	4	5
f. International activities	1	2	3	4	5
g. Continuing education courses	1	2	3	4	5
h. Membership benefits	1	2	3	4	5
i. Corporate sponsorship benefits	1	2	3	4	5
j. Books	1	2	3	4	5
k. Document delivery	1	2	3	4	5
l. Other (please specify) _____	1	2	3	4	5

13. How effective are the following communications in informing you about upcoming AIAA conference? (Circle Number)

	Not At All Effective				Very Effective
a. Call for Papers	1	2	3	4	5
b. Advertising in AIAA publications	1	2	3	4	5
c. Advertising in non-AIAA publications	1	2	3	4	5
d. Direct mail	1	2	3	4	5
e. The Internet	1	2	3	4	5
f. *Aerospace America*	1	2	3	4	5
g. *AIAA Bulletin*	1	2	3	4	5
	1	2	3	4	5

14 How effective are the following communications in informing you about new AIAA information products such as new book titles? (Circle Number)

	Not At All Effective				Very Effective
a. Advertising in AIAA publications	1	2	3	4	5
b. Advertising in non-AIAA publications	1	2	3	4	5
c. Direct mail	1	2	3	4	5
d. The Internet	1	2	3	4	5
e. *Aerospace America*	1	2	3	4	5
	1	2	3	4	5

15. Considering the last AIAA conference you attended, how important were each of the following factors in making your decision to attend? (Circle Number)

	Least Important				Most Important
a. The opportunity for professional development	1	2	3	4	5
b. Encouragement (i.e., monetary support) from my employer	1	2	3	4	5
c. The exhibits	1	2	3	4	5
d. I could combine conference attendance with my vacation	1	2	3	4	5
e. The location (i.e. city) of the conference	1	2	3	4	5
f. Conference agenda/content	1	2	3	4	5
g. The opportunity to network	1	2	3	4	5
h. The caliber and selection of the speakers	1	2	3	4	5
i. The committee meetings	1	2	3	4	5
j. The opportunity to present a paper	1	2	3	4	5
k. Other (please specify)_____	1	2	3	4	5

16. Please rank the following continuing education courses in terms of your interest in attending each. Please enter an "8" for the course you have the highest interest in attending, a "7" for the course having the next highest interest, and so on. Please enter a "0" for any course for which you have NO interest in attending.

a. Introductory course on a new topic ..... ____
b. Fundamental theory course ..... ____
c. State of the art reviews ..... ____
d. Advanced technology course on new topics ..... ____
e. Applications oriented course ..... ____
f. Hands-on workshops ..... ____
g. Classified industry briefings ..... ____
h. Other (please specify) _____ ____

17. Please indicate how important each of the following reasons would be in making your decision to attend AIAA-sponsored continuing educations courses. (Circle Number)

	Least Important				Most Important
a. Relevance of course to your job	1	2	3	4	5
b. Reputation of the course lecturer/instructor	1	2	3	4	5
c. Tuition fee	1	2	3	4	5
d. Only source of course	1	2	3	4	5
e. Employer provided tuition reimbursement and travel	1	2	3	4	5
f. Length of the course (e.g., 2-3 days)	1	2	3	4	5
g. Format of the course (e.g., home study, satellite)	1	2	3	4	5
h. Reputation of the course sponsor	1	2	3	4	5

These data will be used to determine whether people with different backgrounds have different information-seeking behaviors and communication practices.

18. Your gender: (Circle Number)

1. Female
2. Male

19. Your age: (Enter Number)

____

20. The highest college degree you hold: (Circle Number)

1. No college degree
2. Bachelor's
3. Master's
4. Doctorate
5. Post-Doctorate
6. Other (please specify)_____

21. Your primary professional duties: (Circle **ONLY ONE** Number)

1. Teaching/Academic (may include research)
2. Research
3. Design/Development
4. Manufacturing/Production
5. Quality Assurance/Control
6. Service/Maintenance
7. Marketing/Sales
8. Private Consultant
9. Management/Supervision
10. Other (please specify)_____

OVER ⟶

22. Type of organization where you are employed? (Circle **ONLY ONE** Number)

1. Academic
2. Government (civilian)
3. Government (military)
4. Industry
5. Private Consultant
6. Other (please specify)_____

23. Was your academic preparation as an: (Circle Number)

1. Engineer 2. Scientist 3. Other (please specify)_____

24. In your present position, do you consider yourself primarily an: (Circle Number)

1. Engineer 2. Scientist 3. Other (please specify)_____

25. Is English your first (native) language? (Circle Number)

1. Yes 2. No

26. Were you a cooperative education student? (Circle Number)

1. Yes 2. No

27. Your undergraduate QPA/QCA was: (Enter Number) . . . . . _____

28. Your years of continuous professional AIAA membership: (Enter Number) . . . . . _____

29. Your years of permanent (full-time) employment with present employer: (Enter Number) . _____

30. Your years in present position: (Enter Number) . . . . . _____

31. Number of employees in your company at present (geographic) work site: (Enter Number). _____

32. Number of employees in your department/unit: (Enter Number) . . . . . _____

THANK YOU!

Mail to:

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Hampton, VA 23681-0001

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	July 1996	Technical Memorandum

4. TITLE AND SUBTITLE
Factors Motivating and Impending Information-Seeking by Early Career-Stage U.S. Aerospace Engineers and Scientists—Results of an Initial Investigation*

5. FUNDING NUMBERS
WU 505-90

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
NASA Langley Research Center
Hampton, VA 23681-0001

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Washington, DC 20546-0001

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
NASA TM-110213

11. SUPPLEMENTARY NOTES
*Report number 37 under the NASA/DoD Aerospace Knowledge Diffusion Research Project. Elizabeth W. Morrison: New York University, New York, NY; Thomas E. Pinelli: Langley Research Center, Hampton, VA
NOTE: See also NASA TM-110181

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Unclassified–Unlimited
Subject Category 82

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
Selected results from an investigation that focused on the factors motivating and impeding information-seeking by early career-stage (i.e., new) U.S. aerospace engineers and scientists are reported. Undertaken as a Phase 1 activity of the *NASA/DoD Aerospace Knowledge Diffusion Research Project*, this initial investigation used mail (self-reported) surveys to collect data from 312 members of the American Institute of Aeronautics and Astronautics (AIAA) who had converted their AIAA memberships from student to professional status and who had an average of 2.7 years of aerospace work experience. We reviewed literature that focused on the socialization of organizational newcomers and the factors that motivate and impede information-seeking by early career-stage professionals. Seven hypotheses, formulated from our review of the literature, were developed and tested. The results of the investigation add to our understanding of information-seeking by organizational newcomers by demonstrating some of the factors that motivate early career-stage U.S. aerospace engineers and scientists to engage in information-seeking.

14. SUBJECT TERMS
Knowledge diffusion; aerospace engineers and scientists; Information-seeking

15. NUMBER OF PAGES
37

16. PRICE CODE
A03

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	